

REMARKS

Applicants have carefully reviewed and considered the Examiner's Office Action dated September 18, 2008. Reconsideration is respectfully requested in view of the following comments.

By this Amendment, claims 1-22 are canceled and replaced with new claims 23-35. New claim 23 is at least supported by the descriptive passages on page 5, second paragraph and on page 15, first and third paragraph of the section entitled "Example of application in the automotive field" of the present specification, as well as Figures 5 and 7 of the present application. New claim 24 corresponds to original claim 22. New claims 25-30 correspond to original claims 3-8. New claims 31-33 correspond to original claims 12-16, and new claims 34-35 are based on original claims 18 and 20, respectively.

Accordingly, Claims 23-35 are pending in the present application.

Claims 1-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No 4,796,690 to Degobert et al. (hereinafter referred to as "Degobert") in view of U.S. Patent No. 7,119,359 to Alfano et al. (hereinafter referred to as "Alfano"). This rejection is traversed.

The claimed invention is directed to the detection of the concentration of gaseous species, more specifically combustion products, and to the control of a combustion process in a motor vehicle internal combustion engine. In order better to define the claimed invention over the prior art, the new set of claims are directed to a system for controlling a combustion process in a motor vehicle internal combustion engine, rather than a more general optical gas detection system. The claimed invention describes a system constituted by a GaN-based UV

detector combined with UV arc-lamp to be inserted “inside” the exhaust manifold of combustion engines. The lamp emitted/excited light in the presence of the exhaust gas is detected by nitride-based photodetectors whose output signal gives quantitative information about the gas components concentration and is used in a closed loop configuration to modify in real time the fuel injection strategy, to optimize the performances and reduce the emissions.

In general, Degobert and Alfano (applied prior art) relate to generic applications in the field of the invention such as the application of UV detection by nitride based devices and the application of UV spectral analysis for effluents monitoring in combustion engines. However, it is respectfully pointed out that no prior art reference cited by the Examiner mentions the peculiar property of the system according to the claimed invention to include both the source of exciting radiation and the associated photodetector device working “in situ” in the exhaust manifold of a combustion engine and at high temperature ($>500^{\circ}\text{C}$) in order to achieve a self-cleaning operation.

US 4,796,590 to Degobert discloses a method for detection of poor combustion by detecting the effluents leaving a combustion chamber through their absorption of a locally emitted UV radiation. Degobert does not teach a system operating “in situ” (i.e. inside the combustion chamber or the exhaust manifold), comprising an arc lamp whose function is also to excite the effluents and a detector operating at high temperature ($>500^{\circ}\text{C}$). Rather, Degobert discloses that one should not expose the optical detecting system to the exhaust gas (see embodiments depicted in figures 1-3 of Degobert) because of possible contamination of the optical

parts in contact with the gas. See the specific descriptions at col. 3, lines 37-40, 50-52 and 59-61 and col. 4, lines 3-7 of Degobert that discloses ducts for admitting cleaning and cooling fluids to the radiation source and the detector to prevent contamination by contact with the exhaust gases and to eliminate condensation.

The claimed invention is distinguished over Degobert in that it recites “an optical system for detecting gaseous species, mounted on an exhaust duct of the engine”. That is, the claimed optical detecting system is in the exhaust manifold, thereby dealing with temperatures higher than 500 °C which allow the self-cleaning operation of the optical parts of the claimed system. Degobert discloses both the use of a separate solution for cleaning the optical sensor and a system where only a partial amount of gas is in a remote zone sensed by the optical sensor disclosed by Degobert. Degobert does not disclose an optical sensor mounted on an exhaust duct of the engine, as required by the claimed invention.

Alfano was disclosed for its teachings of a highly efficient high-speed photo detector made of the claimed material. While Alfano deals with the technology of GaN-based detectors, there is no description given or at least suggested for an application to an in-situ monitoring device, (i.e. a device exposed to exhaust gases flow and exploiting their high temperatures for self cleaning operation of the optical parts of the system). Thus, Alfano does not overcome the adverse teachings in Degobert, which would not suggest to one of ordinary skill in the art that the asserted combination/result was reasonable.

Specifically, Alfano is related to an unconventional semiconductor device exploiting the resonant tunneling behavior in a nitride-based heterostructure. The claims

of the patents are related to a few and very specific heterostructures comprising a p-i-n junction which embeds AlGaIn/GaN multiple quantum wells with metal contacts on p and n surfaces. Alfano asserts that its device can act as a UV photodetector, possibly transforming the absorbed UV light into infrared emission through the resonant tunneling process in the quantum wells. While Alfano mentions combustion sensing and control for aircraft engines in the Description of the Related Art, the disclosure is directed to III-nitride based photodetectors (column 1, lines 22-25 of Alfano). In fact, Alfano discloses that its claimed invention is used predominantly for the detection of external light signals or infrared lights, not as light sources themselves (see column 2, lines 38-44 of Alfano). That is, the invention disclosed by Alfano is not directed to gas sensing, in situ operation in engines (independent claim 23 of the present application) and integrated heating for self cleaning (which is the subject-matter of dependent claim 24 of the present application).

Further, the advantageous features recited in the characterizing portion of independent Claim 23 are neither anticipated nor suggested by any of the prior art references of record or combinations thereof. It is respectfully submitted that one of ordinary skill in the art, in the absence of Applicants' specification, would not have combined Alfano and Degobert to achieve the claimed invention because Degobert teaches against such a combination and Alfano is directed to another type of device. It is only Applicants' specification that discloses mounting an optical system on an exhaust duct of the engine to determine the concentration of the gaseous species present in the mixture through detection of the change in the spectrum emitted by the radiation source.

Consequently, it is believed that the combination of references is improper because it relies upon Applicants' own teachings to assert an impermissible hindsight reconstruction of the claimed invention.

Thus, the system defined in independent Claim 23 is believed to be patentable over the prior art of record. With respect to the dependent claims, the asserted combination fails to disclose the recited additional features (e.g., heating means of claim 24 or the characterized feature of claims 25-35). Thus, the dependent claims are allowable over the applied combination for their recited additional features and the features of independent claim 23, as argued above.

Accordingly, it is submitted that independent claim 23 and dependent claims 24-35 are patentable over any combination of the prior art of record. Consequently, withdrawal of the rejection under 35 U.S.C. §103(a) and allowance of claims 23-35 is requested.

It is believed that no fee is due, however, the Director is authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or any paper hereafter filed in this application by this firm) to our Deposit Account No. 22-0261, under Order No. 18628-232562.

Should the Examiner believe that a conference would advance the prosecution of this application, he is encouraged to telephone the undersigned counsel to arrange such a conference.

Respectfully submitted,

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/Catherine M. Voorhees/
Catherine M. Voorhees
Registration No. 33,074
VENABLE LLP
P.O. Box 34385
Washington, D.C. 20043-9998
Telephone: (202) 344-4000
Telefax: (202) 344-8300

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